4-1921

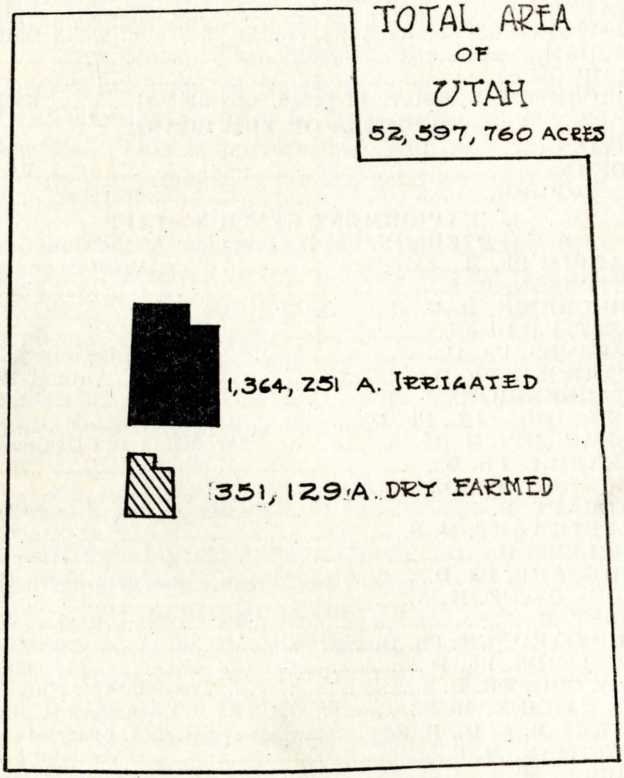
Circular No. 44 - The Agriculture of Utah

F. S. Harris

THE AGRICULTURE OF UTAH

By

F. S. HARRIS



CIRCULAR NO. 44

Utah Agricultural College

EXPERIMENT STATION

Logan, Utah

April, 1921

UTAH AGRICULTURAL EXPERIMENT STATION

BOARD OF TRUSTEES

A. W. IVINS.....Salt Lake City
JOHN DERN.....Salt Lake City
ANGUS T. WRIGHT.....Ogden
LOIS C. HAYBALL.....Logan
FRANK B. STEPHENS.....Salt Lake City
JOHN D. PETERS.....Brigham City
W. S. HANSEN.....Fielding
R. L. JUDD.....Salt Lake City
J. H. WATERS.....Salt Lake City
E. O. HOWARD.....Salt Lake City
O. H. BUDGE.....Logan
C. P. CARDON.....Logan
H. E. CROCKETT, Secretary of State, (Ex-officio).....Salt Lake City

OFFICERS OF THE BOARD

A. W. IVINS.....President
JOHN DERN.....Vice-President
JOHN L. COBURN.....Secretary and Treasurer

EXPERIMENT STATION STAFF

E. G. PETERSON, Ph. D., President of the College
F. S. HARRIS, Ph. D.,.....Director and Agronomist
WM. PETERSON, B. S.,.....Geologist
H. J. FREDERICK, D. V. M.,.....Veterinarian
F. L. WEST, Ph. D.,.....Physicist
J. E. GREAVES, Ph. D.,.....Chemist and Bacteriologist
W. E. CARROLL, Ph. D.,.....Animal Husbandman
BYRON ALDER, B. S.,.....Poultryman
GEORGE R. HILL, JR., Ph. D.,.....Botanist
O. W. ISRAELSEN, M. S.,.....Irrigation and Drainage Engineer
M. C. MERRILL, Ph. D.....Horticulturist
D. S. JENNINGS, Ph. D.,.....Soil Survey
R. J. BECRAFT, B. S.,.....Range Management
GEORGE STEWART, M. S.,.....Field Crops
R. L. HILL, Ph. D.,.....Human Nutrition
E. B. BROSSARD, Ph. D.,.....Farm Management
GEORGE B. CAINE, M. A.,.....Dairying
C. T. HIRST, M. S.,.....Associate Chemist
WILLARD GARDNER, Ph. D.,.....Associate Physicist
B. L. RICHARDS, Ph. D.,.....Associate Botanist
BLANCHE COOPER, B. S.,.....Associate in Human Nutrition
EZRA G. CARTER, M. S.,.....Associate Bacteriologist
M. D. THOMAS, A. B., B. Sc.,.....Associate Agronomist
D. W. PITTMAN, M. S.,.....Assistant Agronomist
T. H. ABELL, M. S.,.....Assistant Horticulturist
A. F. BRACKEN, B. S.....Assistant Agronomist
YEPPA LUND, M. S.,.....Assistant in Chemistry and Bacteriology
L. F. NUFFER, B. S.,.....Assistant Botanist
ARTHUR FIFE, B. S.,.....Assistant in Irrigation
N. E. EDLEFSEN, B. S.,.....Assistant Physicist
SCOTT EWING, B. S.,.....Assistant Soil Survey
G. E. KING, B. S.,.....Assistant Entomologist
A. L. WILSON, B. S.,.....Superintendent Davis County Farm
PETER NELSON, B. S.,.....Farm Superintendent
J. R. BATEMAN, B. S.,.....Superintendent Panguitch Farm
HERBERT J. PACK, B. S.,.....Assistant Entomologist
BLANCHE CONDIT PITTMAN, A. B.....Clerk and Librarian
K. B. SAULS, B. S.,.....Secretary to the Director

IN CHARGE OF CO-OPERATIVE INVESTIGATIONS WITH U. S. DEPARTMENT OF AGRICULTURE

L. M. WINSOR, B. S.,.....Irrigation Engineer

THE AGRICULTURE OF UTAH

By

F. S. HARRIS[1]

Agriculture is so intimately related to all other industries that anything which affects the farmer reflects itself in all branches of business. The banker, the merchant, and the manufacturer must keep in touch with crop and livestock conditions of the country in order to foresee the tendencies of their own businesses. This is particularly true in a state like Utah which depends fundamentally on the products of the soil for its prosperity.

Numerous requests are received by the Experiment Staiton from prospective settlers living outside of the state for informataion concerning the agriculture of Utah. These have been kept in mind in the preparation of this circular. It is also hoped that the facts herein presented will be of interest to farmers and business men within the state who wish to inform themselves more fully regarding its agricultural conditions and outlook.

AGRICULTURE IN RELATION TO OTHER INDUSTRIES

Utah will probably always be chiefly an agricultural state and yet its resources are sufficiently diverse to enable a number of other important industries to flourish. Table I shows the net value of the products of manufacturing, mining, and agriculture for the census years 1900 and 1910. In the case of manufactured products this net figure represents the value of the products minus the cost of the materials entering into them.

Table I.—Total Net Value of the Products of Agriculture, Mining, and Manufacturing in Utah for the Census Years 1900 and 1910

	1900	1910
Agriculture: value of crops, animals, and animal products sold	$16,502,000	$29,943,000
Mining: net value of products	12,200,000	21,976,000
Manufacturing: value of products less the cost of materials	13,986,000	20,723,000

[1]The author has drawn freely on the United States Census Reports and all other available sources for the material of this circular. He wishes to acknowledge his indebtedness to Mr. N. I. Butt for his painstaking assistance in collecting and tabulating data.

Another method of expressing the relative importance of the various industries is through the number of persons engaged in each. This is shown for the United States and for Utah in Fig. 1. In 1880, 44 per cent of all the workers of the country were engaged in some phase of farming, while in 1910 the number had been reduced to 32.9 per cent. The decrease for Utah during this period was from 36.8 to 28.4 per cent. The only other type of occupation approaching agriculture as represented by the number employed is that including manufacturing and mechanical workers. These embrace quite a number of distinct businesses so that agriculture is the most important industry of the state from the point of view of employment as well as from production.

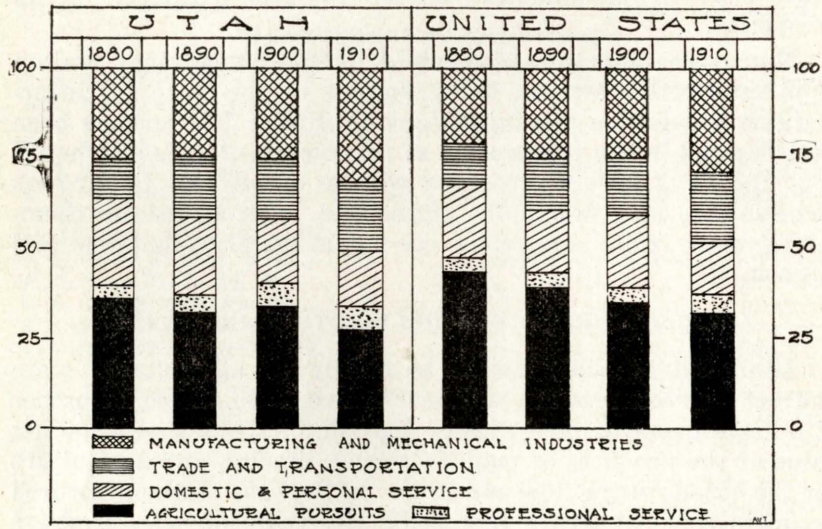


Fig. 1.—The percentage of all persons engaged in each occupataional division in Utah and the United States for the census periods 1880 to 1910.

The relative number required to carry on the work of farming is gradually decreasing because of the more scientific farm practices and also because of improved machinery.

AGRICULTURAL DEVELOPMENT

When Utah was settled in 1847 the pioneers immediately began to till the land. Plow furrows led irrigataion water from City Creek over the parched land which was then plowed and planted to crops. Agriculture was practically the only source of income of the pioneers during the first few years after the

territory was settled. As settlers spread out from Salt Lake City farming communities were established wherever water for irrigation could be had. These colonies in a very few years had extended from Cache Valley on the north to St. George on the south. Thus the state during the first few decades after its settlement was made up almost entirely of a large number of scattered farming communities.

While the promise of gold in the surrounding mountains called some from the land, most of the settlers followed the advice of their leader, Brigham Young, and devoted themselves to the building of an agriculture capable of supplying the needs of the people for food and clothing independent of the rest of the world.

With the establishment of transcontinental rail connections in 1869 the settlers were less dependent on their own production for all necessities, and were better able therefore to develop new industries.

The population of the state, the number of farms, and the size of the farms during each census period are shown in Table II.

Table II.—Population, Number of Farms, and Size of Farms in Utah During the Various Census Years from 1850 to 1920

Year	Population	Number of Families	Number of Farms	Improved Land in Farms (acres)	Improved Acres per Farm	Number of Farms Irrigated	Acres under Irrigation	Acres Irrigated per Farm
1850..	11,380	2,322	926	16,333	18	.....	16,333	18
1860..	40,273	7,473	3,635	77,219	21	.....	.....	....
1870..	86,786	17,210	4,908	118,755	24	.....	.....	....
1880..	143,963	28,373	9,452	416,105	44	.....	.....	....
1890..	210,779	38,816	10,517	548,233	52	9,724	263,473	27
1900..	276,749	56,196	19,387	1,032,117	53	17,924	629,293	35
1910..	373,351	77,339	21,676	1,368,211	63	19,709	999,410	50
1920..	449,396	.....	25,662	1,715,380	67	.....	1,364,251	....

Table II shows that the size of the average farm has gradually increased from 18 to 67 acres. Several conditions have helped to bring this about. Improved farm machinery, better methods of transportation and communication, and the extending of the dry-farming area have doubtless all played a part. The total number of farms has increased from 926 to 25,662. While the population is now less than forty times what it was in 1850, the improved land in farms is over a hundred times that of 1850.

The production of the more important crops of the state

during the census years from 1850 to 1920 is given in Table III. This shows a gradual increase in wheat, hay, and sugar-beets each ten years over each of the previous periods. The increase with oats, corn, barley, and potatoes has been much more irregular. For example, in 1910 decidedly more oats, barley, and potatoes were produced than in 1920. The increase in total production of hay, barley, and oats has been proportionately much greater between 1850 and 1920 than the other crops.

Table III.—Production of Wheat, Oats, Corn, Barley, Potatoes, Hay, and Sugar-beets in Utah During the Census Years from 1850 to 1920

Year	Wheat (bushels)	Oats (bushels)	Corn (bushels)	Barley (bushels)	Potatoes (bushels)	Hay (tons)	Sugar-beets (tons)
1850..	107,702	10,900	9,899	1,799	43,968	4,805	.....
1860..	384,892	63,211	90,482	9,976	141,001	19,235	.....
1870..	558,473	65,650	95,557	49,117	323,645	27,305	.....
1880..	1,169,199	418,082	163,342	217,140	573,595	92,735	.....
1890..	1,515,465	597,947	84,760	163,328	519,497	301,901	.....
1900..	3,413,470	1,436,225	250,020	252,140	1,483,570	850,962	85,914
1910..	3,943,910	3,221,289	169,688	891,471	2,409,093	1,015,913	413,946
1920..	4,100,979	1,724,392	265,361	365,186	1,648,400	1,031,609	930,427

The number of animals in the state during each census period is given in Table IV, which shows that with the exception of sheep the largest number occurred in 1920. Sheep have decreased in numbers since 1900 but still show the most marked increase in numbers of any other class of animals during the whole period.

Table IV.—Number of Beef Cattle, Dairy Cattle, Horses and Mules, Sheep, Swine, and Poultry in Utah During the Census Years from 1850 to 1920

Year	Beef Cattle	Dairy Cattle	Horses and Mules	Sheep	Swine	Poultry
1850..	7,755	4,861	2,754	3,262	914	.....
1860..	22,127	11,967	5,416	37,332	6,707	.....
1870..	21,617	17,563	13,947	59,672	3,151	.....
1880..	99,887	32,768	41,029	523,121	20,621	222,616
1890..	232,331	45,982	88,422	1,936,906	27,046	296,309
1900..	198,845	65,905	106,147	2,553,134	65,732	556,753
1910..	336,524	75,810	117,953	1,827,180	64,286	691,941
1920..	407,622	124,040	141,666	1,702,905	113,564	980,097

Figure 2 is presented to show the approximate distribution of the irrigated and the dry-farmed land of the state. While the great masses of irrigated land lie mainly in the central and north central parts of the state, the distribution is much more uniform for the irrigated than for the dry-farmed areas. A large proportion of the dry-farms are confined to the central and extreme northern sections.

The number of farms in each county of the state each census

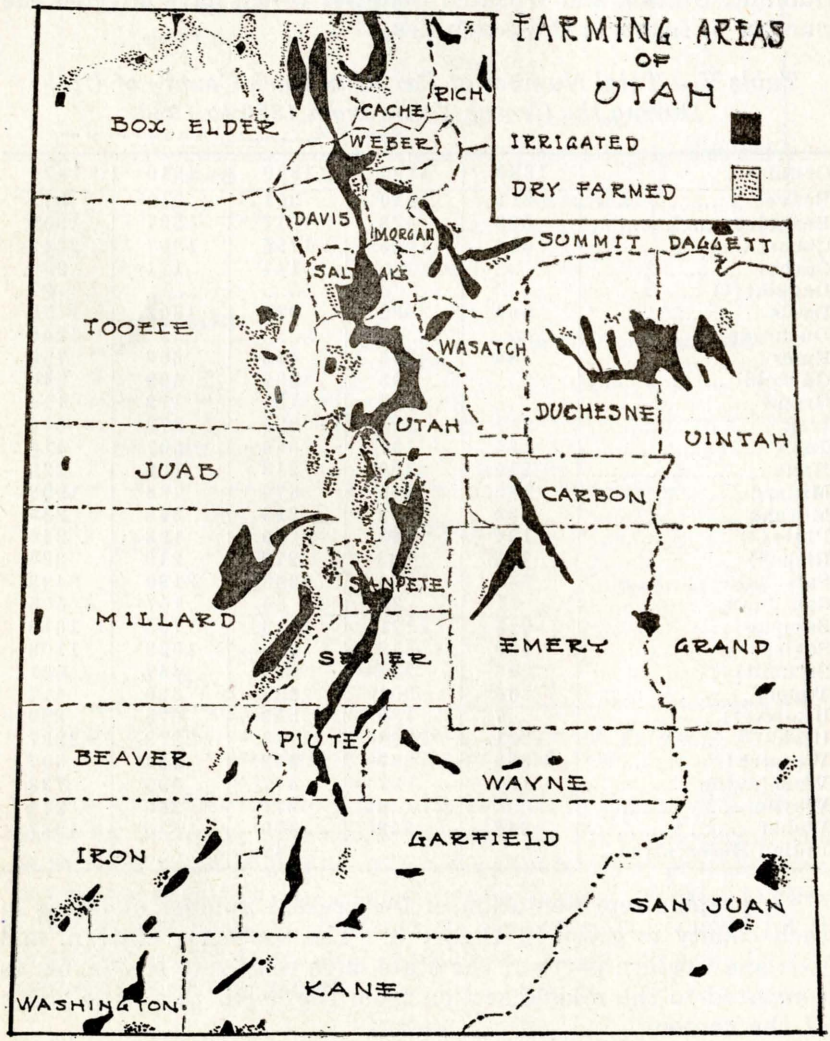


Fig. 2.—Approximate Distribution of Irrigated and Dry-farmed Areas of Utah.

year from 1880 to 1920 is given in Table V. It will be noted that in most of the counties the number of farms has gradually increased. Exceptions to this are found in Davis, Morgan, Grand, Juab, Summit, and Wasatch Counties where there have been some decreases in number of farms. This has usually resulted from the fact that the cultivated area is limited and farms have been combined to make larger ones but fewer of them. There have been changes in boundaries of Piute, Rich, Sevier, Summit, Uintah, and Wasatch Counties which have affected the number of farms in these counties.

Table V.—Total Number of Farms in Each County of Utah During the Census Years from 1880 to 1920

County	1880	1890	1900	1910	1920
Beaver	211	210	301	319	373
Boxelder	533	478	1017	1527	1859
Cache	998	1065	1795	1907	2242
Carbon	.....	.....	144	171	235
Daggett(1)	.....	.....	.....	.....	37
Davis	560	682	938	1302	1172
Duchesne(1)	.....	.....	.....	.....	1248
Emery	84	266	458	666	759
Garfield	.....	93	237	409	540
Grand	.....	56	121	172	114
Iron	217	198	235	373	646
Juab	185	97	356	507	419
Kane	214	120	213	166	229
Millard	235	306	676	736	1038
Morgan	182	238	299	242	239
Piute(2)	134	143	189	198	246
Rich(3)	153	193	276	219	224
Salt Lake	961	1366	2208	2180	2438
San Juan	31	38	85	157	405
Sanpete	1015	1191	1618	1708	1813
Sevier(2)	429	312	946	1059	1108
Summit(3)	298	362	608	447	521
Tooele	304	301	487	320	417
Uintah(3)	7	186	559	675	899
Utah	1321	1198	2760	2873	3237
Wasatch(3)	339	289	492	964	507
Washington	193	187	477	598	738
Wayne	.....	.....	271	246	272
Weber	848	942	1479	1535	1687
Indian Reservation	.....	.....	142	.....	.....

A graphic representation of the present number of farms in each county is given in Figure 3. The southern, eastern, and extreme western parts of the state have relatively few farms as compared to the middle section from the north to a little south of the center.

(1)New county; (2)Boundary changes 1900-1910; (3)Boundary changes 1910-1920.

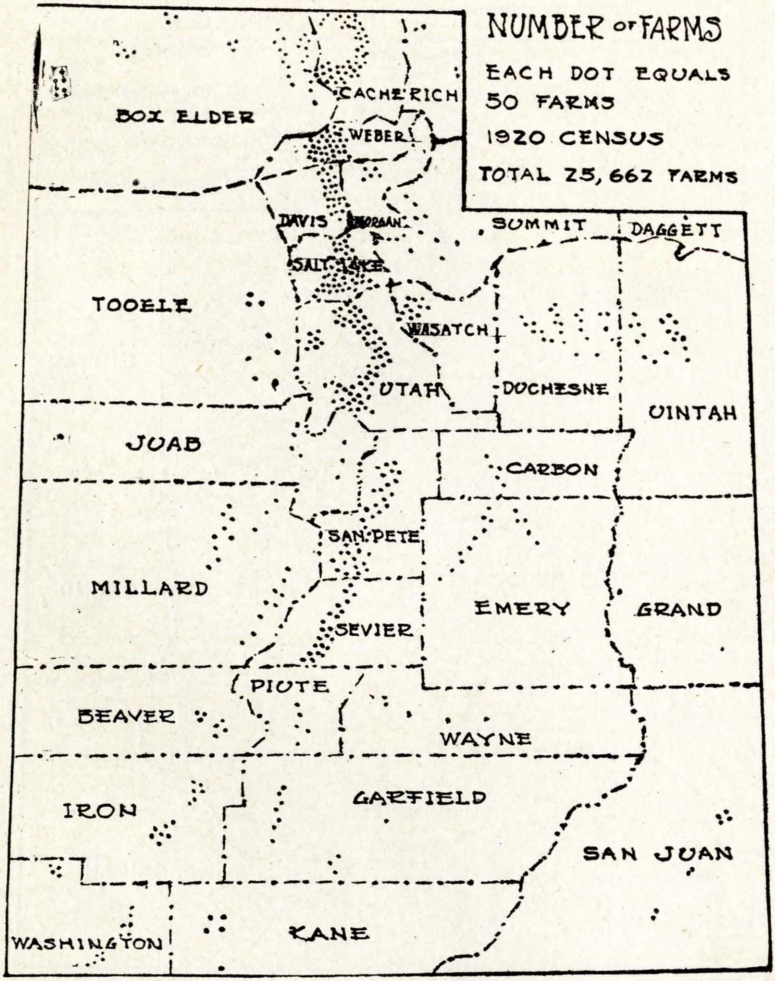


Fig. 3.—Number and Approximate Location of Farms in Each County for the Census Year 1920.

As would be expected, the distribution of farms is much the same as the total population presented in Figure 4 except that in Salt Lake and Weber Counties the population is proportionally much higher due to Salt Lake City and Ogden. Neither of these cities is dependent on the farms of its respective county for its population; both cities are essentially industrial and railroad centers for several states.

CLIMATE

The climate of Utah has already been so well discussed by West and Edlefsen in Utah Station Bulletin No. 166 that no

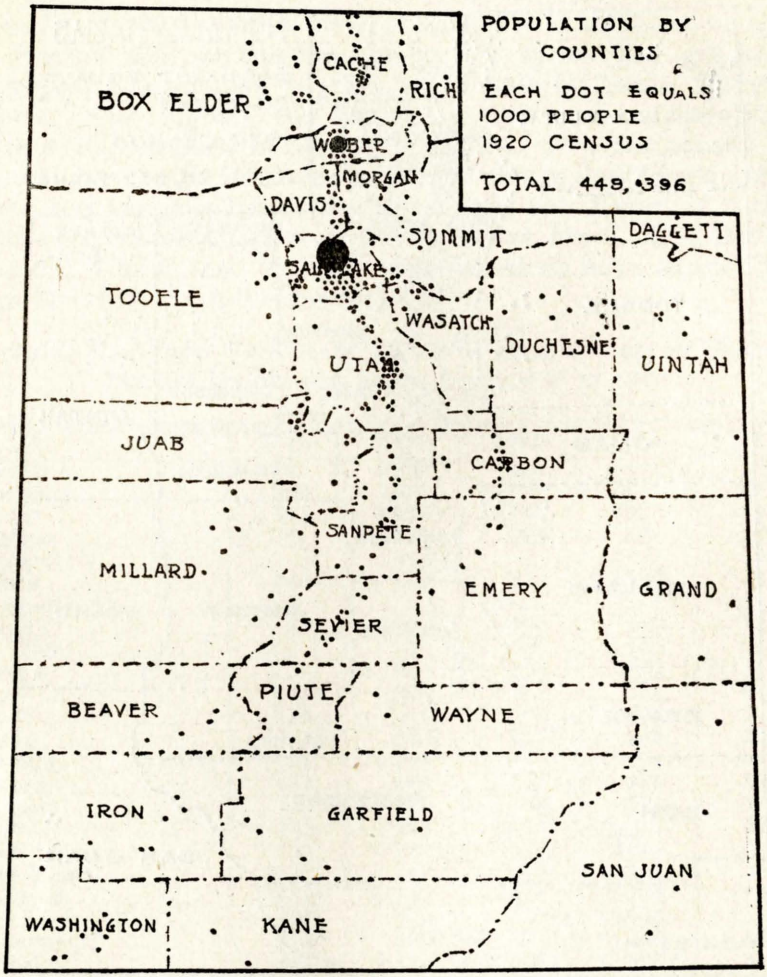


Fig. 4.—Number of People in Each County for the Census Year 1920

thorough discussion is needed here. Only a few outstanding facts will be recounted.

An examination of Figure 5 shows that most of the state has less than 20 inches of annual rainfall. Throughout the important agricultural sections the precipitation ranges from 10 to 20 inches. Only a small amount of land is cultivated in the sections receiving less than 10 inches of rain each year. The lowest rainfall is found in the region west of the Great Salt Lake. Most of the extreme western, as well as the eastern, parts of the state are low in precipitation. In the southeastern

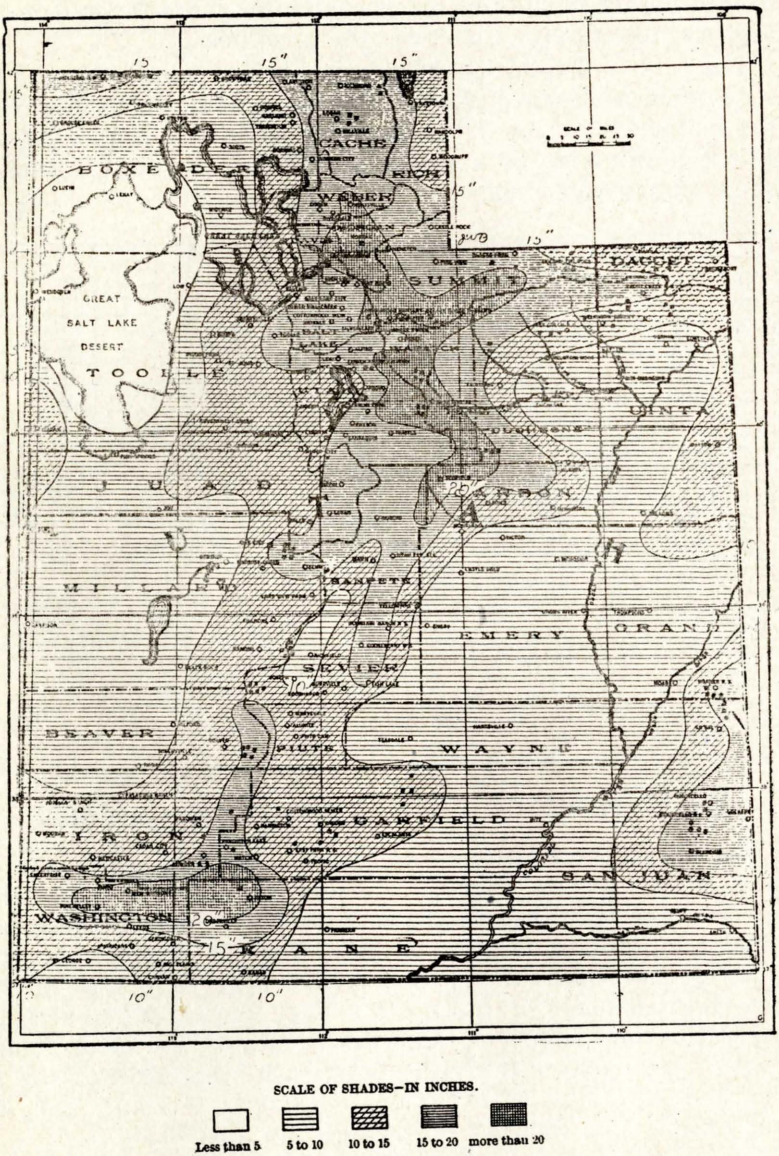


Fig. 5.—Normal Annual Precipitation for Utah.

and northeastern sections there is somewhat more rainfall than in the east central portion. The highest rainfall is in the north central part of the state extending along the main mountain range from north to south through the state. Valleys adjacent

to these higher mountains are considerably more favored in the moisture they receive than are other sections.

The total precipitation during each year from 1892 to 1917 in a number of typical places is shown graphically in Figure 6. This indicates that as a rule a wet year in one portion of the state is a fair sign of a wet year in other portions, although this is not always true.

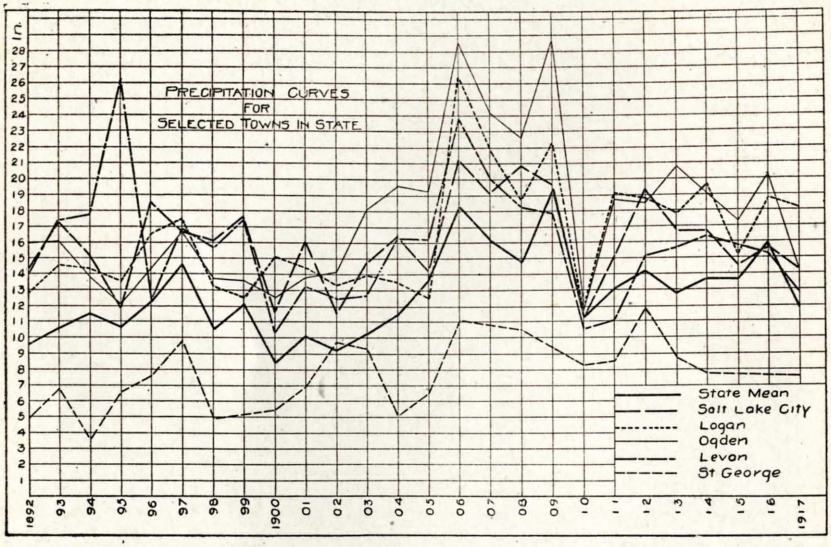


Fig. 6.—Precipitation Curves for Selected Towns in Utah.

The average temperature of various parts of the state is shown graphically in Figure 7. Here all places having the same average temperature are connected by a line. The mean annual temperature is seen to vary from 58 degrees in the southwest and south central section to 39 degrees in some of the more elevated parts of the north. Very radical differences in temperature and length of the growing season are often found between places only a few miles from each other where there is a marked difference in elevation. Destructive winds, hail, or other uncongenial weather phenomena are uncommon.

SOILS

The soils of Utah are exceedingly variable on account of the diversity of conditions under which they were formed and numerous kinds of rock from which they were derived. Most of the soils of that part of the state known as the Great Basin were laid down originally in Lake Bonneville. In the middle

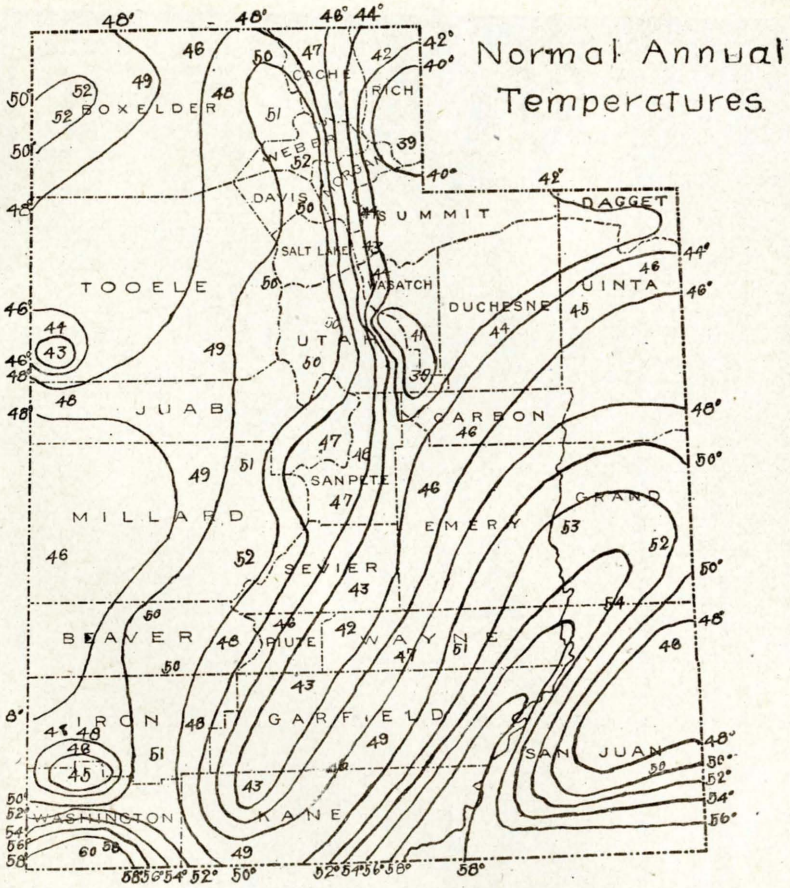


Fig. 7.—Mean Isotherm Map of Utah.

portions of the valleys the soils are of fine texture and are frequently difficult to till. They also often contain a rather high percentage of soluble salts. Around the edges of the valleys the soils are as a rule of a more sandy texture and are sometimes underlaid with gravel. Deltas are generally found at the mouths of prominent canyons. These delta soils make up some of the better fruit-producing lands found along the west side of the Wasatch Mountains.

The relief map in Figure 8 shows the western part of the state to contain great areas of comparatively level land. It is unfortunate, however, that most of this section receives so little rain, and it is so highly impregnated with alkali salts that it is not at present suitable for agriculture. The most productive

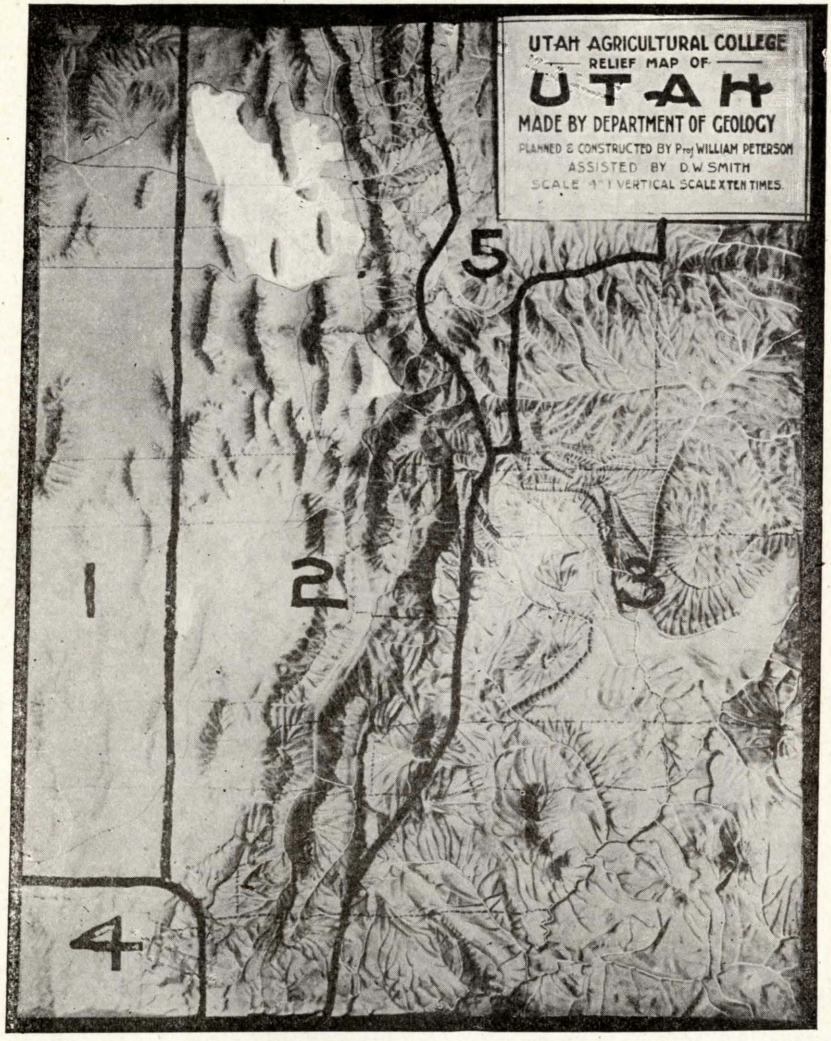


Fig. 8.—Relief Map of Utah Showing Location of Valleys.
The Figures Indicate Climatic Zones.

soils are found in the valleys parallel to the main mountain range which extends through the central part of the state. Many of the mountains are made up largely of limestone rock, portions of which have been weathered off to form the fertile soils of the valleys.

The soils of the eastern part of the state have been derived mainly from the weathering of sandstone and shale of com-

Table VI.—Chemical Composition of Soils from Various Parts of Utah

Constituents	6 Locations Cache Valley Average	5 Locations Sanpete County Average	College Loam	Greenville Loam 1st 12 inches	Dry-farms						
					Juab	San Juan	Sevier	Iron	Tooele	Washington County (Enterprise)	Washington County (near St.George)
Insoluble residue	81.09	58.85	66.69	42.18	73.12	88.25	80.78	52.14	80.13	81.74	77.93
Potash (K_2O)	.99	.78	.55	.67	1.31	.83	.83	.55	.95	.87	.58
Soda (Na_2O)	.53	.62	.49	.35	.14	.36	.34	.44	.41	.23	.36
Lime (CaO)	1.78	12.50	7.41	16.88	4.27	.56	1.34	18.97	2.15	3.01	5.37
Magnesium (MgO)	.73	.84	4.15	6.10	1.82	.75	.42	2.24	.47	1.06	2.54
Oxid of Iron (Fe_2O_3)	2.95	2.71	2.93	3.03	3.92	3.10	5.42	2.80	4.49	3.14	2.36
Alumina (Al_2O_3)	5.61	8.41	3.49	5.64	6.33	3.06	5.74	2.29	5.60	4.19	3.45
Phosphoric Acid (P_2O_5)	.22	.19	.25	.41	.42	.24	.26	.23	.31	.24	.17
Carbon dioxid (CO_2)	.....	10.14	7.62	19.83	2.16	.20	.62	18.55	1.01	1.96	4.49
Organic matter	6.34	4.83	.....	.....	.....	.....	.....	.....	.....	.....	.....
Humus	1.99	2.14	2.18	.53	1.54	1.49	1.45	1.09	1.16	1.63	.58
Nitrogen	.....	.....	.13	.14	.12	.06	.09	.06	.01	.09	.03

paratively recent geological origin. These rocks are not so favorable to the formation of a good soil as those of limestone since they are likely to be high in alkali salts and low in some of the elements required for the growth of crops.

Because the soils are so exceedingly variable in texture, structure, depth, and chemical composition it is impossible from a description of the soil of one area to tell what will be the nature of that of another area.

A general idea of the chemical composition of a number of typical soils of Utah may be had by examining Table VI. This table shows that all the soils are fairly well provided with phosphorus and potash, the main elements which are lacking in many soils of the United States. The soils are all rather low in nitrogen and humus, however.

Both the soil and the climate of Utah are such that the problems of soil management center largely around the question of supplying water, removing alkali, and adding organic matter and nitrogen.

CROPS

While conditions in Utah are suitable to a great variety of crops most of the income is derived from a comparatively few products. The distribution of income from the main types of crops is given in Table VII which shows that nearly half of the total value is hay and forage with cereals ranking second.

Table VII.—Value of All Crops Produced in Utah in 1919

Crops	Value in Dollars
Cereals	$12,388,557
Other grains and seeds	1,364,638
Hay and forage	24,759,397
Vegetables	5,615,888
Fruits and Nuts	3,822,739
All other crops	10,115,848
Total value of all crops	$58,067,067

The individual crops making up these main crop types are shown in Table VIII.

The acreage of the various crops harvested during the census years from 1879 to 1919 is given in Table IX which shows hay and forage to have maintained their present lead since 1879. Previous to this time wheat was the principal crop.

Figures 9 and 13 graphically give the acreage of the main crops produced in the different counties. From Figure 9 it is seen that hay production is widely distributed through the state. Wherever land is cultivated some hay is raised. Since most of the hay is consumed locally the acreage is somewhat

Table VIII.—Area and Yield of the Various Crops Produced in Utah During the Census Year 1919

Crop	Area	Yield
Cereals: Total	370,849 acres	6,535,068 bu.
Corn	13,848 acres	265,361 bu.
Oats	61,825 acres	1,724,392 bu.
Wheat	268,457 acres	4,100,979 bu.
Barley	15,938 acres	365,186 bu.
Rye	10,378 acres	72,507 bu.
Other Grains and Seeds		
Dry Edible Beans	414 acres	3,636 bu.
Dry Peas	547 acres	12,939 bu.
Hay and Forage: Total	549,967 acres	1,031,609 tons
All Tame or Cultivated Grasses	439,934 acres	861,543 tons
Timothy alone	13,343 acres	21,077 tons
Timothy and clover mixed	33,164 acres	53,993 tons
Clover alone	2,849 acres	4,043 tons
Alfalfa	365,190 acres	748,949 tons
Other cultivated grasses	25,388 acres	33,481 tons
Wild, Salt or Prairie Grasses	80,942 acres	95,158 tons
Small Grains Cut for Hay	15,589 acres	17,585 tons
Silage Crops	3,890 acres	31,380 tons
Corn Cut for Forage	6,638 acres	12,623 tons
Root Crops for Forage	933 acres	8,914 tons
Vegetables		
Potatoes (Irish or White)	12,047 acres	1,648,400 bu.
Other Vegetables	8,309 acres	
Sugar-beets Grown for Sugar	93,359 acres	930,427 tons
Fruits and Nuts		
Small Fruits: Total	910 acres	1,198,200 qts.
Strawberries	254 acres	484,792 qts.
Raspberries	383 acres	363,801 qts.
Currants	108 acres	172,201 qts.
Orchard Fruits: Total	1,666,908 trees	1,934,421 bu.
Apples	806,775 trees	759,696 bu.
Peaches	582,753 trees	883,950 bu.
Pears	60,291 trees	76,008 bu.
Plums and Prunes	74,422 trees	50,677 bu.
Cherries	120,341 trees	123,477 bu.
Grapes	238,502 vines	1,102,625 lbs.
Nuts	13,659 trees	61,374 lbs.

proportionate to the total number of farms and is distributed similarly. Figure 10 shows that most of the wheat is produced in the north and central parts of the state. Cache, Boxelder, Utah, and Sanpete Counties lead in this cereal. Oats, presented in Figure 11, have somewhat the same general distribution as wheat, although the central rather than the northern parts of the state lead. A much more restricted distribution is noted for sugar-beets in Figure 12. This is not entirely a question of adaption but results in part from the fact that a sugar factory near at hand is necessary for profitable sugar-beet raising.

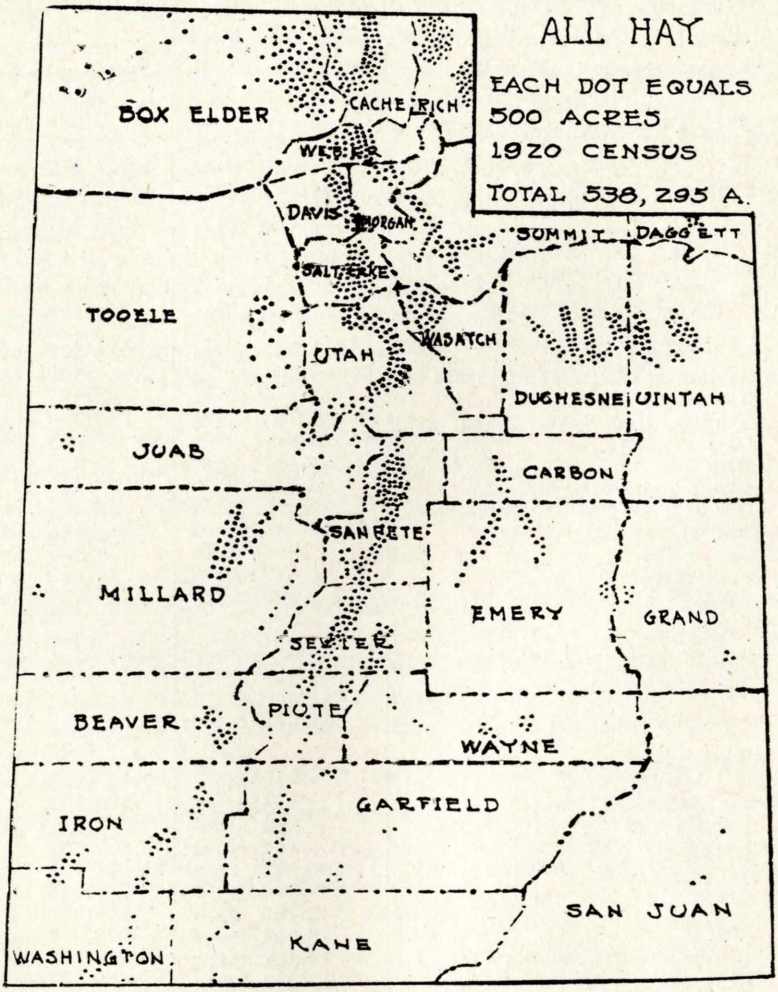


Fig. 9.—Total Acreage of Hay Grown in Each County During 1919. From 1920 Census Data.

Table IX.—Acreage of Important Crops in Utah 1879 to 1919

Crop	1879	1889	1899	1909	1919
Corn	12,007	5,782	11,517	7,267	13,848
Oats	19,525	22,747	43,394	80,816	61,825
Wheat	72,542	84,505	189,235	178,423	268,457
Barley	11,268	6,440	8,644	26,752	15,938
Hay and forage	65,214	159,368	388,043	405,428	549,967
Potatoes	7,800	6,591	10,433	14,210	12,047
Sugar-beets for sugar	.....	.....	.....	27,442	93,359

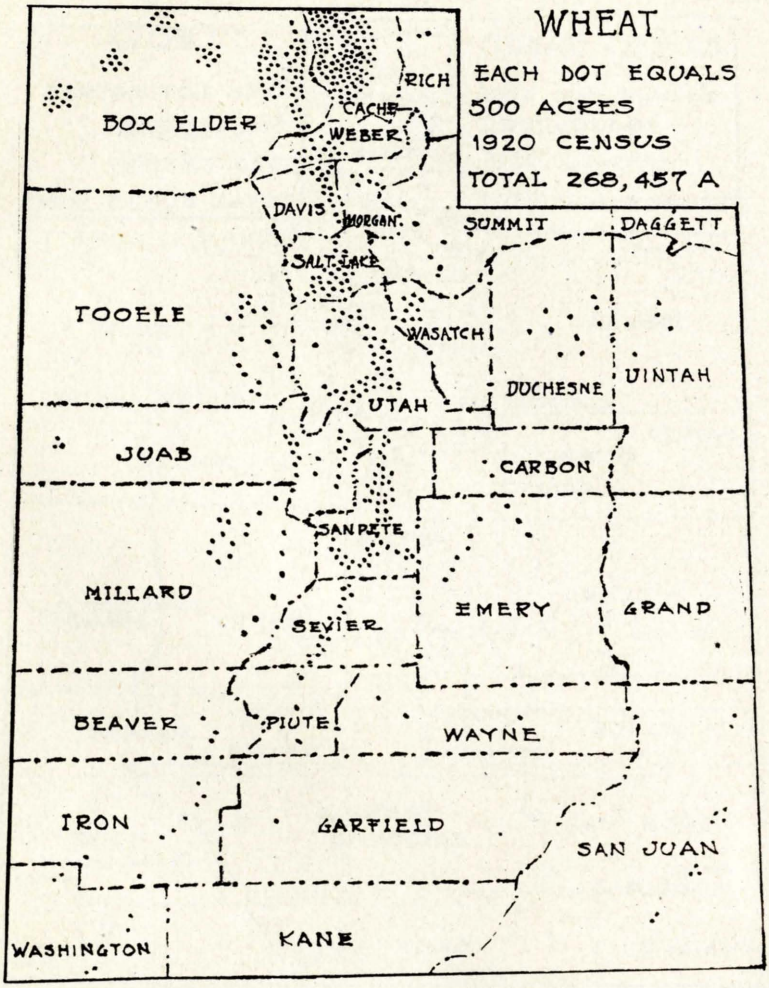


Fig. 10.—Acreage of All Wheat Grown in Each County During 1919. From 1920 Census Data.

The great bulk of the fruit of the state is produced in Salt Lake and Utah Lake valleys. The former includes Boxelder, Weber, Davis, and Salt Lake Counties, whereas the latter is entirely in Utah County. A small amount of fruit is shown in Figure 13 to be produced in all the counties, but aside from those already named there is not much commercial production except in Washington County where a number of semi-tropical fruits and nuts find a market outside of the county.

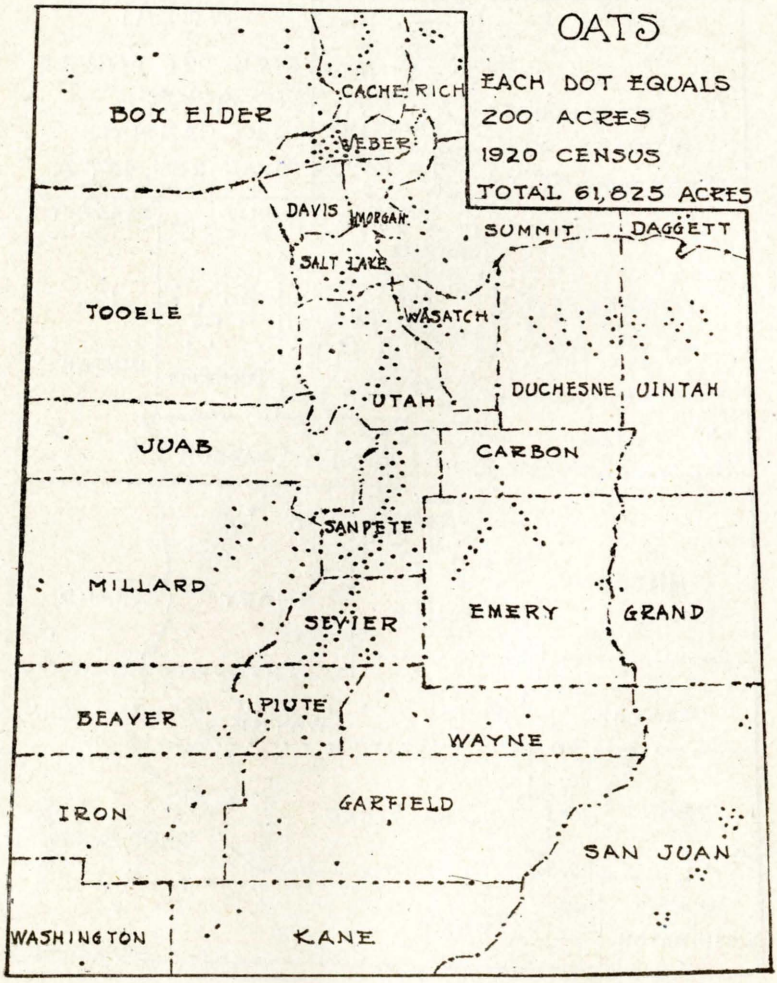


Fig. 11.—Acreage of Oats Produced in Each County During 1919. From 1920 Census Data.

LIVESTOCK

Since the greater part of Utah is not adapted to the raising of cultivated crops on account of the large area of mountainous land and the lack of adequate rainfall, the state will always devote a considerable amount of attention to livestock. The crop of probably 90 per cent of the total area must be harvested by stock if it is harvested at all.

Another condition which increases the importance of stock

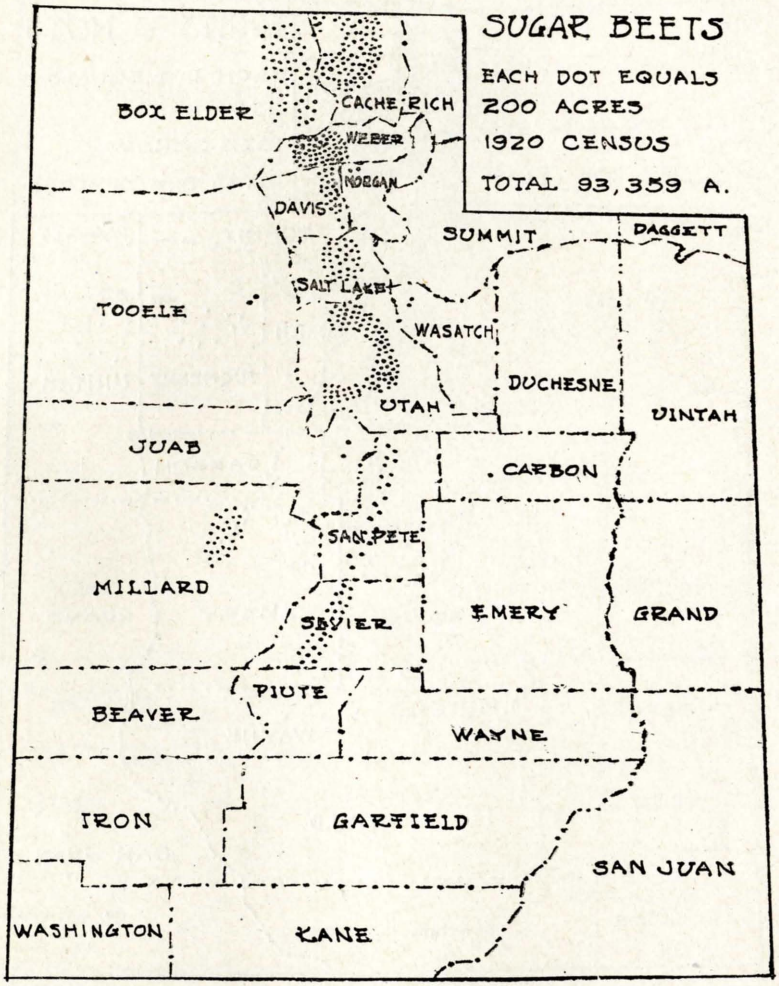


Fig. 12.—Acreage of Sugar-beets Produced in Each County During 1919. From 1920 Census Data.

is the fact that a number of the farming communities are located so far from the railroad that ordinary crops cannot profitably be hauled to market. In such places it becomes necessary to dispose of crops through stock, which can be driven to market.

The total value of the stock in the state in 1920 is given by the census as $52,973,251. This is divided among the various groups as follows: horses, $9,642,418; mules, $216,454; beef

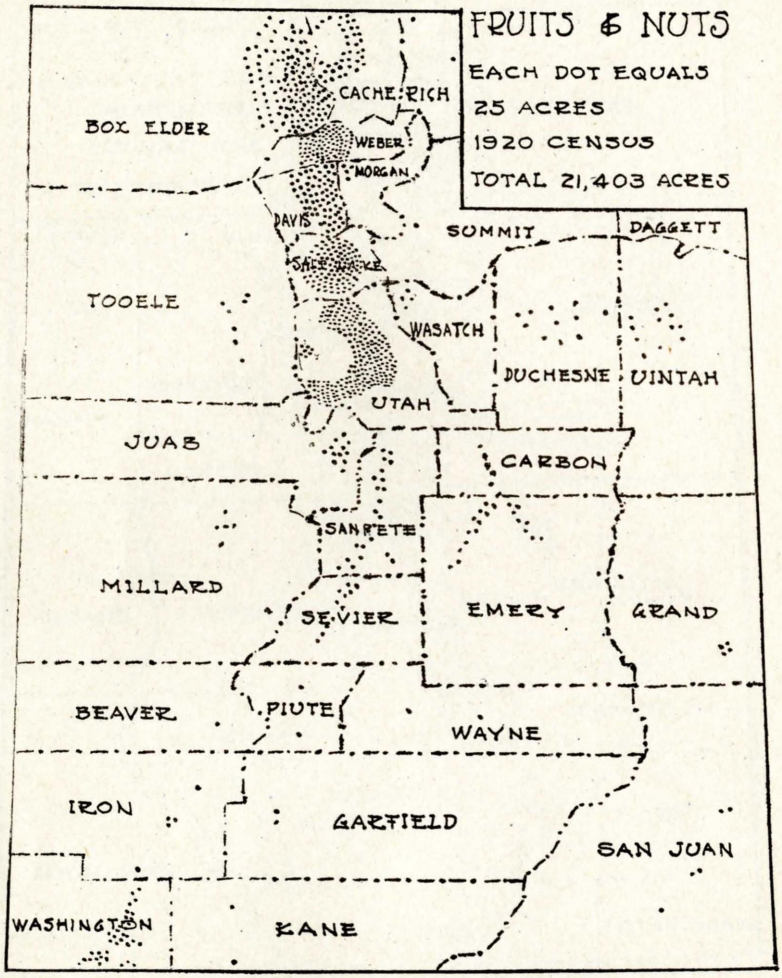


Fig. 13.—Acreage of All Fruits and Nuts Produced in Each County During 1919. From 1920 Census Data.

cattle, $16,806,429; dairy cows, $5,821,441; sheep, $18,881,529; goats, $253,100; and swine, $1,351,880.

In 1919 the 66,724 dairy cows in the state produced milk and milk products valued at $4,809,087. During the same year, the 1,691,795 sheep produced 11,690,303 pounds of wool valued at $5,728,248.

The distribution of cattle, horses, sheep, and swine throughout the various counties is presented graphically in Figures 14 to 18. Cattle other than those used principally for milk produc-

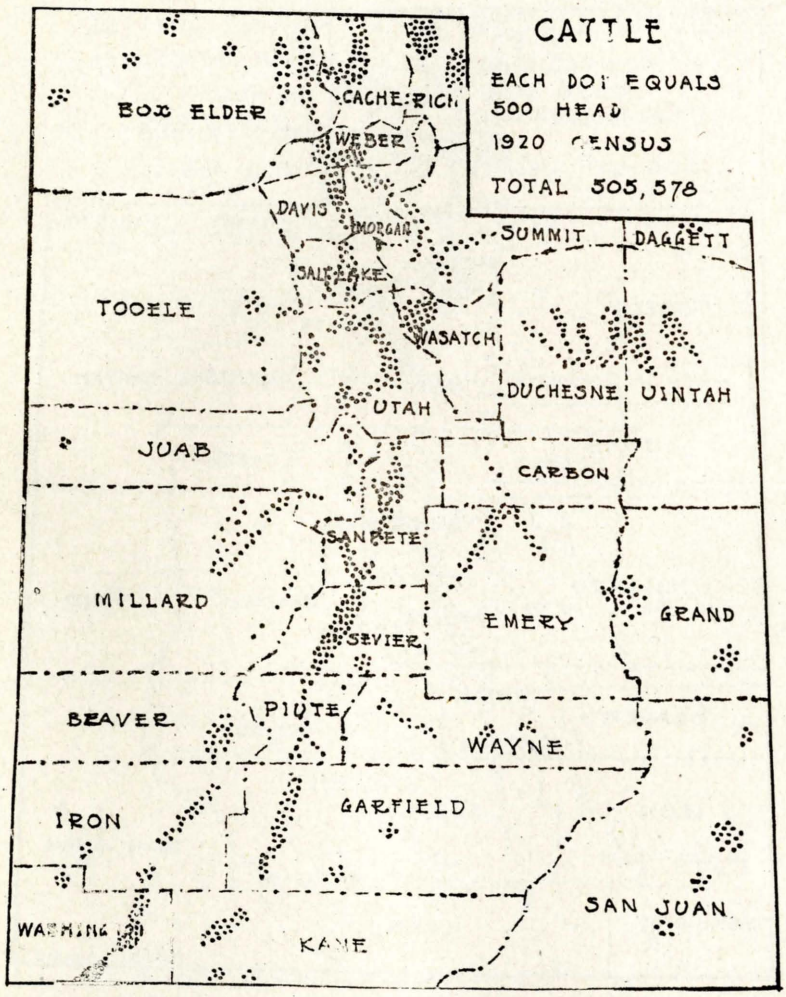


Fig. 14.—Number of Cattle Kept Principally for Beef Production in Each County for the Census Year 1920.

tion are shown by Figure 14 to be well distributed throughout the state. Carbon, Juab, and Daggett Counties have the fewest. Figure 15 indicates a much greater localization in dairy cows than is found with other cattle. The northern and central counties are most important in dairying. The distribution of horses and mules is shown in Figure 16 to be much the same as that for other cattle. Sheep, like dairy cows, have their special areas. A number of the southern counties, such as Iron and Kane which are low in most agricultural products, are rela-

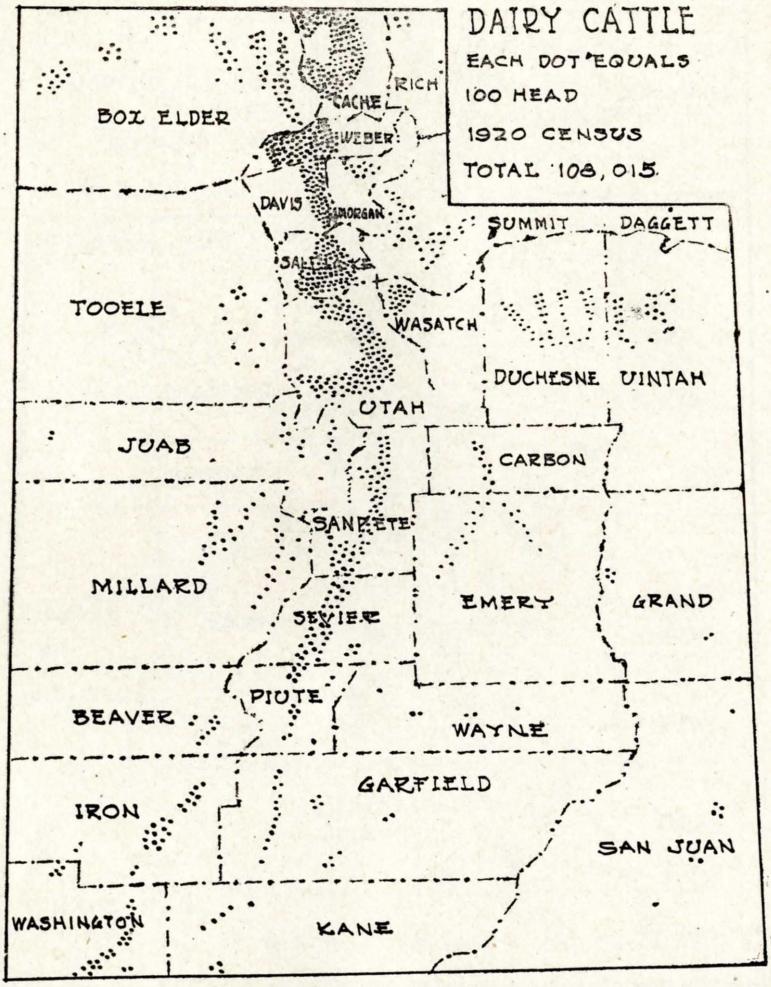


Fig. 15.—Number of Cattle Kept Principally for Milk Production in Each County for the Census Year 1920.

tively important in sheep-raising. The counties with considerable numbers of sheep are near extensive ranges, either forest or other, where cheap food may be obtained.

The number and distribution of swine do not vary greatly from that of horses and mules. Comparing Figure 18 with Figure 3, giving the number of farms, it is seen that the distribution is very similar, apparently indicating that a considerable proportion of the hogs are raised for home consumption only.

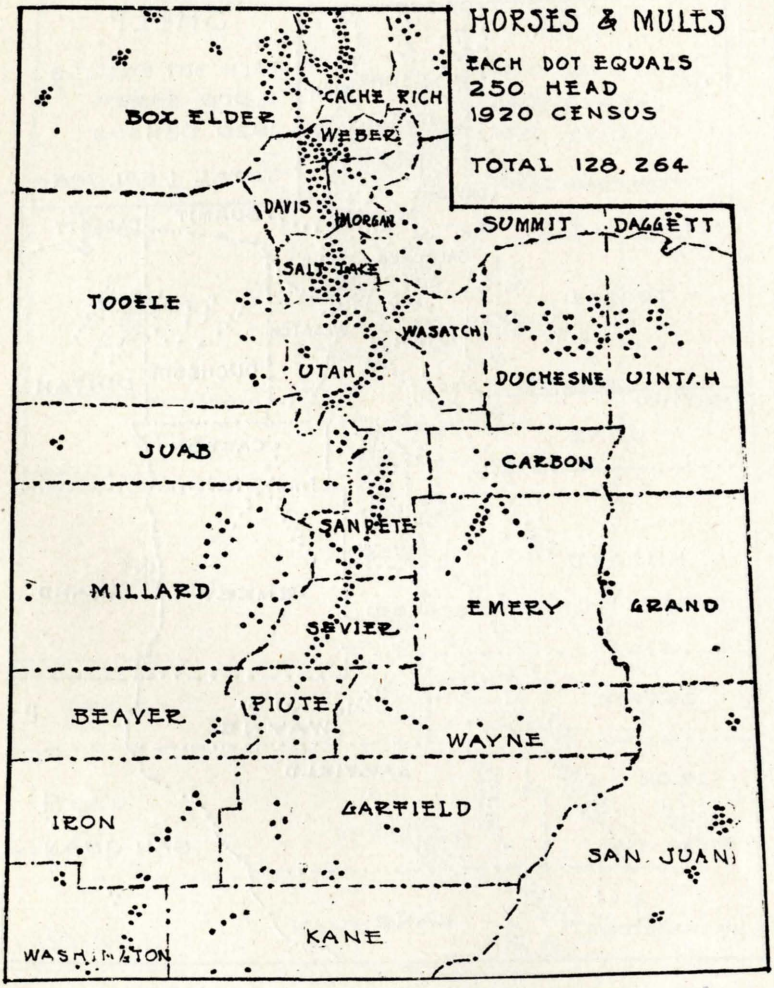


Fig. 16.—Number of Horses and Mules in Each County for the Census Year 1920.

POULTRY AND BEES

In addition to the larger kind of stock there were, in 1920, 954,695 chickens in the state. In 1919 these produced 5,709,070 dozen eggs valued at $2,112,358. The report for 1920 shows 25,061 hives of bees which in 1919 produced 1,232,239 pounds of honey valued at $246,447 and 18,933 pounds of wax valued at $5,300.

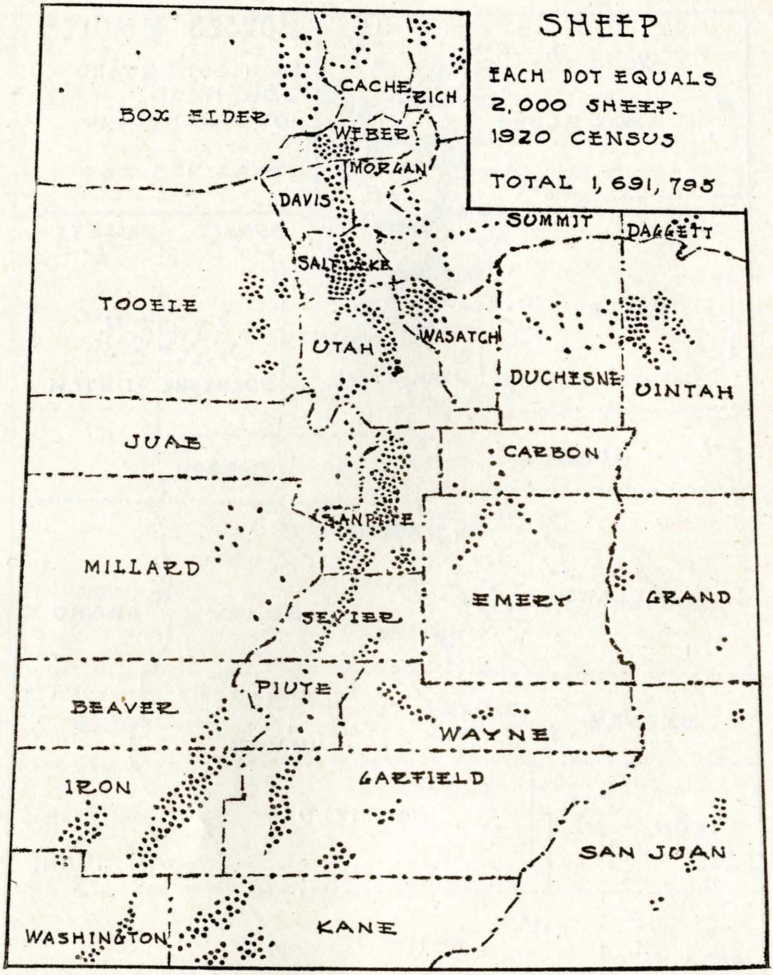


Fig. 17.—Number of Sheep in Each County for the Census Year 1920.

INCREASING PRODUCTION

One distressing feature about the agriculture of any of the arid states is the fact that such a small part of their area produces crops. Most of the land is waste except as it furnishes meager forage to livestock during a part of the year. However, the area required for each animal is so large that the value of such forage is comparatively low. These conditions lead those who are working for the agricultural betterment of these states

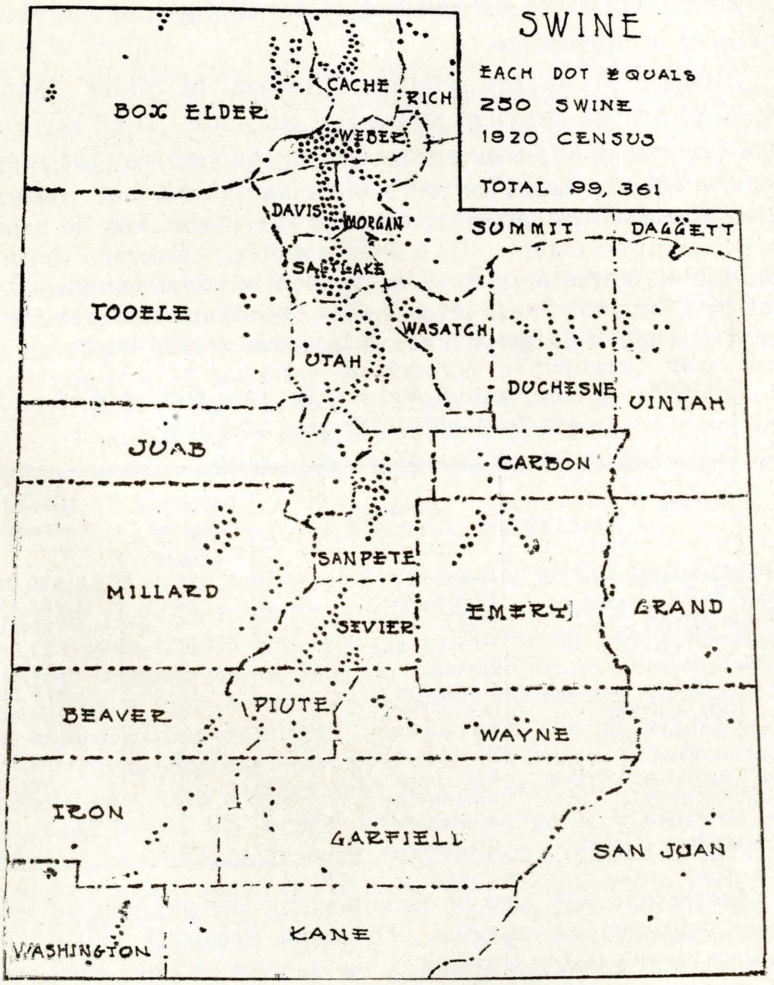


Fig. 18.—Number of Swine in Each County for the Census Year 1920.

to devote a large amount of attention to extending the area of cultivated land.

The problem of increasing agricultural production in Utah may be considered from two angles: (1) enlarging the farm area and (2) improving methods on land that is at present cultivated.

The supply of water for irrigation is one of the chief factors limiting the cropped area. While the amount that comes to the state cannot be increased, much can be done to make more

efficient use of the present supply by storage and by better methods of application.

Table X shows the average acre-feet of water annually flowing through the chief streams of the state. If all this water could be stored and used on the land in the best way the present cultivated area could be increased many times, but unfortunately some of the larger rivers, like the Green, can be used to only a limited extent. It seems possible, however, that the present irrigated area may be doubled by more complete utilization of waters of such rivers as the Weber and the Provo which have storage facilities and are adjacent to fertile lands.

Table X.—Mean Annual Run-off in Acre-feet of Water of the Important Streams of Utah

Stream	Location	Period of Record (years)	Run-off (acre-feet)
Green River	Green River	20	5,480,000
Bear River	Collinston	14	1,450,500
Weber River	Plain City	9	759,200
Provo River	Provo Canyon	11	327,700
Logan River	Logan	9	215,200
Sevier River	Gunnison	15	210,300
San Rafael River	Green River	5	205,000
Blacksmith Fork	Hyrum	10	129,600
Spanish Fork	Spanish Fork	12	98,300
Big Cottonwood Creek	Salt Lake City	11	64,200
Hobble Creek	Springville	8	41,300
Beaver River	Minersville	7	29,700
Santa Clara Creek	St. George	3	23,000

Much land will also be reclaimed by the pumping of water from subterranean supplies. The great Escalante Valley which has no river passing through it has in some sections what seems to be an extensive supply of ground water. When economic conditions warrant the pumping of this water, many fertile acres will be added to the productive area of the state.

In most of the valleys of Utah where irrigation has long been practised some of the lower lands are being waterlogged and alkali has become a menace. The proper drainage of these lands with the elimination of the alkali and the economical utilization of the excess water will make available for production much higher-class land not now suitable for farming.

Dry-farming has by no means reached its full development. While the best lands have probably been taken, there are still hundreds of thousands of acres capable of producing profitable

crops without irrigation when scientific dry-farm practices are applied to them.

While the acre-yield of most crops in Utah compares very favorably with that of other states much increase in production can be brought about by improved tillage methods. Rotations are practised to only a limited extent, whereas they are capable of greatly increasing crop yields. Many farmers do not make full use of their stable manure. If properly utilized it would add much to present yields.

Utah is particularly well situated for securing her own mineral fertilizers. The largest known American supplies of phosphate and potash are at her very doors and cheap hydro-electric power is at hand for the fixation of nitrogen. Also the vast coal fields make possible a cheap supply of ammonium sulfate. These available supplies of fertilizing materials are in time sure to reflect themselves in increasing crop production of the state.

A WORD TO PROSPECTIVE SETTLERS

The lure of cheap land has often led to the loss of many years' savings by people who have been anxious to leave the city for the more open life on the farm. Well-meaning but misguided "boosting" organizations desirous of building up the country by an influx of new settlers have widely advertised unoccupied areas where land is cheap and where a farm can be had for the asking. These glowing accounts of the freedom of farm life and of the ease with which a farm may be secured have especially appealed to the city worker who has saved a little money. The result has frequently been that he has burned all bridges behind him and plunged boldly into the farming game without knowing the first thing about it. As a consequence he has been forced into a desperate fight for a year or two, depending on how much money he had saved, but only too often he has had to abandon his homestead and return to his former occupation poorer but wiser.

All of the western states have had numerous cases paralleling the one mentioned above. The trouble has come largely from the fact that there have been two uncertain elements: (1) it was not certain that this city man could make a success of farming even under the most favorable conditions, and (2) it was by no means sure that the new land he took up could be made to pay even by the most experienced farmer. With this combination failure has resulted in very many instances.

The lesson to be taken from this is that persons knowing nothing about farming who wish to engage in it should go to

sections that are known to be suitable for agriculture. Here they can learn the business, then if later they wish to go to an untried country they have experience to help them.

It is not the intention here to discourage the settlement of new lands; in fact, Utah has hundreds of thousands of acres at present idle that probably should be supporting profitable agriculture. The great aim, however, should be to see that these lands are subdued by men having the experience that will enable them successfully to cope with the difficult situation.

The failure on the part of those making the first settlement of new land delays very considerably the final successful reclamation of the area. It is much better that no attempt be made to bring new land under the plow until conditions are right for success. A failure is bad for the individual and also bad for the district.

The State Agricultural College through its Experiment Station and Extension Division and the United States Department of Agriculture is prepared to supply information concerning farming and to give advice to prospective settlers. It is to the advantage of those seeking farms in new regions to make full use of these free public agencies.

OUTLOOK

On account of its arid climate and the extensive mountain areas in the state, Utah can never have a large proportion of its surface devoted to agriculture. The percentage of cropped land will always be comparatively small. This does not, however, interfere with the quality of the agriculture nor render profits less on the areas that are cultivated. While Utah can never rival some of the other states in the total quantity of her agricultural products, yet her individual farms are probably in as safe and prosperous a condition as those of any other state in the Union. Her agricultural production is limited, but the limit has not yet been approached. There is still an opportunity for much expansion on both irrigated and dry-farmed lands. Production may also be greatly augmented by the development of more intensive methods till it reaches many times it present volume.

(College Series No. 158)

AVAILABLE UTAH EXPERIMENT STATION PUBLICATIONS

Bulletins

121. The Soil of the Southern Utah Experiment Station.
122. The Nature of the Dry-farm Soils in Utah.
124. Fruit Variety Tests on the Southern Utah Experiment Farm.
125. The Chemical Milling and Baking Value of Utah Wheats.
127. Report of the Richmond-Lewiston Cow Testing Association.
128. Blooming Periods and Yields of Fruit in Relation to Minimum Temperatures.
129. Codling Moth Studies in 1911.
130. The Change in Weight of Grain in Arid Regions During Storage.
131. Variety Tests of Field Crops in Utah.
132. Minor Dry-land Crops at the Nephi Experiment Farm.
133. Irrigation and Manuring Studies, Pt. I.
134. The Nitric Nitrogen Content of the Country Rock.
135. A Study of Annual Egg Production.
136. The Commercial Production of Sugar-beet Seed in Utah.
137. The Quality of Home-grown Wheat vs. Imported Wheat.
138. How to Control the Grasshoppers.
139. The Movement of Soluble Salts With the Soil Moisture.
140. The Summer Pruning of a Young Bearing Apple Orchard.
141. Variation in Minimum Temperatures Due to the Topography of a Mountain Valley in Relation to Fruit Growing.
142. Irrigation of Peaches.
143. Fruit Tree Root Systems—Spread and Depth.
144. Water Table Variations—Causes and Effects.
145. Soil Alkali Studies.
146. The Irrigation of Wheat.
147. Alkali Content of Irrigation Waters.
149. Breeding for Egg Production, Pt. II.
150. Further Studies on the Nitric Nitrogen Content of the Country Rock.
151. The Freezing of Fruit Trees.
152. Effect of Soil Moisture Content on Certain Factors in Wheat Production.
153. Selecting Dairy Bulls by Performance.
154. Irrigation and Manuring Studies, Pt. II.
155. The Beet Leafhopper.
156. The Irrigation of Sugar-beets.
157. The Irrigation of Potatoes.
158. Soil Moisture Studies Under Dry-farming.
160. Important Factors in the Operation of Irrigated Farms.
161. Orchard Heating.
162. A Quick Method of Obtaining Accurate Egg Records Without the Trap Nest.
163. Composition of Irrigation Waters of Utah.
164. Factors Affecting the Depth of Sowing Various Crops.
165. Labor Costs and Seasonal Distribution of Labor in Irrigated Crops.
166. The Climate of Utah.
167. The Irrigation of Oats.
168. Relative Resistance of Various Crops to Alkali.
169. The Use of Alkali Water for Irrigation.
170. A Study of Methods of Determining Soil Alkali.
171. Alfalfa Seed Growing and the Weather.
172. The Value of Barnyard Manure on Utah Soils.
173. The Duty of Water in Cache Valley, Utah.
174. A Variety Survey and Descriptive Key of Small Grains in Utah.

175. Sixteen Years of Dry-farm Experiments in Utah.
176. Potato Improvement by Hill Selection.
177. Some Types of Irrigation Farming in Utah.
178. Pathogenicity of Rhizoctonia.
179. Apple Candy—A Commercial Use for Cull Apples.
180. The Irrigation of Alfalfa.

Circulars

6. Measurement and Distribution of Irrigation Water.
8. Varieties of Fruit Recommended for Planting in Utah.
9. Pruning the Apple Orchard.
10. The Control of the Alfalfa Weevil.
12. Thinning Apples.
15. Pastures and Pasture Grasses for Utah.
16. Better Seed.
18. Better Horses for Utah.
19. Licensed Stallions in Utah During Season of 1915.
21. Dry-farming in Utah.
22. Some Sources of Potassium.
23. The Seed Situation in Utah.
24. Licensed Stallions in Utah During Season of 1916.
25. Preserving Eggs for the Home.
26. Storing Vegetables for Winter.
27. Licensed Stallions in Utah During Season of 1917.
28. Contagious Abortion in Mares and Cows.
29. Control of Rodent Pests.
30. The Codling Moth.
31. The Alfalfa Weevil.
32. Feeding Farm Animals.
34. Sugar-beet Production in Utah.
35. Licensed Stallions in Utah During Season of 1918.
36. Practical Information on Measurement of Irrigation Water.
37. Field Beans.
39. A Day at the Utah Agricultural Experiment Station.
40. Potato Production.
41. Soil Alkali.
42. How to Cull a Flock of Hens.
43. Feeding Work Horses.
44. The Agriculture of Utah.